

Naturally, it is normal for our nation to face numerous challenges. Population, climate change, pollution, desert regions, and urban congestion are some of Egypt's major grand challenges. We are studying urban congestion this semester. Bridge construction will have a noticeable impact on traffic in cities. There will be a better allocation of traffic among the available highways if there are more bridges. The number of bridges and the number of cars on a single bridge are negatively correlated. Therefore, we are constructing a bridge that will enhance transportation between two banks and reduce Egypt's urban congestion rate.

The solution:

After considering a number of prior solutions, we chose one. This semester, it must be bridge. There were numerous types of bridges that we might employ as our option. Our bridge's mechanism is dependent on tension force. As shown in Figure (), the bridge will be pulled to open the gate for the ships. Our movable portion is separated into two halves. The tension force will be spread between the two components, easing the strain and reducing the effort required to pull. The fixed part's length is 60cm, according to the prototype. The movable component has a total length of 30 cm. The truss portion is made up of three sections: the aside parts, which are on either side of the fixed part. The third portion is located below the prototype's floor. Hinges are used to connect the movable and permanent parts (Fig).

We joined two palm tree sticks at the end of the movable section to pull and push.

First trail:

Due to our lack of preparation, we made a few mistakes on the first trial. The fixed component was where we started. The maximum dimensions for the palm tree sticks, as per the design specifications, are 5 ml\*15 cm. We had sticks longer than 15 cm. We decided to cut them into 15cm pieces. Cutting all of the sticks

took a very long time. Initially, there were roughly 270 sticks. After cutting the sticks, we moved to stage two, where the sticks are pasted together to form the prototype's entire structure. We started by using the white glue. We used the white glue to adhere a portion of the bridge's surface. It took us about two days to let it dry completely. Following the drought, we observed that it took longer than two days since it was still soft on the inside and had little hardness. After two more days of waiting, we used the five kilos to test it. The sticks were not properly attached to one another, and the deflection was not tiny. Thus, we decided against utilizing the white adhesive. Additionally, a lot of sticks were wasted, and we were unable to use them again.

#### Second trail:

We made an effort to steer clear of the errors we made in the first trail in our second one. We substituted a different kind of glue for the white glue. Gasoline melted cork. We used it to join the sticks together, and it was much better. We began with the truss portion and gave it two days to fully dry. When we began connecting them to the fixed part's floor, the two sections were not parallel to one another, which caused issues with the bridge's stability.

#### Third trail:

After disassembling the sticks, we began reassembling them in a more efficient manner to give the truss an equal shape. The truss portion in the third trail was parallel to one another since the sticks were mounted together on a level surface. Once each component was dry, we began joining the pieces to create the prototype's final shape. The components of the bridge were firmly joined together thanks to the excellent new glue. The five kilograms might be carried by the prototype. The deflection was almost non-existent in the third trail.

We can conclude both positive and negative points:

The fact that we had to try several types of glue, which delayed our job. It squandered a lot of palm tree sticks that we required later. The incorrectly measured sticks also caused delays in the job. The sticks' round form was not ideal for connecting because

they were not parallel to each other.

The fact that, after several trials and attempts, the truss component effectively supported the five kilograms, and the deflection decreased with each trial.

**PH 1.01:** measurement errors that used in measuring the different parts of the prototype. Helped us to reach the best results and decreasing the rate of deflection. Reaching more accurate results as well. the law of absolute error  $\Delta x = |x_0 - x|$ . Using SI units (meter-kilo).

**ME1.01:** Position/Time Graphs: Help engineers monitor bridge components' movements under forces like wind or traffic to ensure stability.

Velocity/Time Graphs: Assist in planning material transport to avoid congestion and

ensuring machinery operates at safe speeds, enhancing safety during bridge construction.

**MA 1.02:** The histograms and building bridges are about understanding data. The histogram shows how often different things happen, like how heavy vehicles will use the bridge. Engineers use this information to design the bridge. So, histograms help them make smart choices in building bridges, the boxplot may help to display defective data at all the load levels. These assist in identifying any sort of developing trends, anomalies or changes in performance as a means for enhancing bridge design. It represents the data connection for deflection by graphical form.

**PH 1.02:** newton's third law, free body diagram and the static and dynamic equilibrium are used in knowing the stability of the bridge,

distributing the force correctly and to test the bridge's equilibrium statically and dynamically in order. Also, testing if the bridge would endure the ordered weight. Law of weight force "F=MA".

**PH 1.05:** the law of center of mass is used in weight distribution, support and stability  $x_{c_m} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$

test plan:

Our prototype goal is going to be built as a bridge using an eco-friendly material (the palm tree wood) to connect two areas and banks in addition to help solve urban congestion. The design requirements we should follow and check are:

1- The bridge must withstand a traffic load that does not exceed 5 Kg.  
Hence, after constructing our prototype, the prototype going to be

tested its strength by putting weight on it

2- The clearance between the water level and the lowest point of the deck of the bridge is 5 m.

To check and ensure that the bridge can bear a traffic load which was 5 Kg, it is going to be put some rocks with known weights on the fixed part.